
# *Ground Team Member*


# *Home Study Course Part II*

# SECTION VII

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## *LAND NAVIGATION:*

OBJECTIVES: On completion of section VII, the ground team member will be able to:

- Define Land Navigation.
- The importance of Land Navigation in SAR.
- Name the grid systems used for locating a point on the earth's surface.
- Name the grid system most often used in the Civil air Patrol.
- Name other navigation systems and explain how they differ from the system used by the Civil Air Patrol, explain some advantages and disadvantage of each.
- Be able to discuss Topographic Maps, symbols, contour lines, positioning and the use with a compass.
- Explain various types of compasses, the advantage and the disadvantage of each type.
- Explain the use of the compass and the use of the map and compass in locating your position, and locating a target.
- Be able to explain how to orient a map, take a barring using a compass and convert the bearing to the topographical map.
- Explain how to measure distance on a map.
- Explain how an ELT can be located by triangulation of a signal bearing.
- Explain how to triangulate a bearing to an ELT signal.

**Land Navigation:**

Land navigation is the most important skill for any searcher or rescuer. Even in an urban area, familiarity with land navigation is important for locating and securing an ELT, or determining that it's coming from a non-urban area and a different team is required.

**Grid systems:**

In order to locate a point on earth, some sort of reference system is used. Grid systems are similar to a street address, in a standardized format and method that will work almost anywhere in the world. The standard latitude and longitude system is used in CAP and aviation, as well as other systems. Latitude is a measurement of how far north or south of the equator you may be, measured in degrees, minutes and tenths of a minute (or seconds, 1/60th of a minute), and longitude is the measurement east or west of a "prime meridian" located near London, England. Fortunately, all of CAP's operations are North latitude and West longitude. Coordinates should always be given with the latitude first, then the direction (North or South), and then the longitude and direction (West or East). These directions should ALWAYS be given in full, specifying the degrees, minutes and seconds, with the directions (North and West).

**Latitude and longitude:**

Navigation begins with is a common reference system or imaginary grid "drawn" on the earth's surface by parallels of latitude and meridians of longitude. The numbers representing a position in terms of latitude and longitude are known as the coordinates of that position. Each is measured in degrees, and each degree is divided into 60 smaller increments called minutes. Each minute may be further divided into 60 seconds but more usually it is divided into tenths and hundredths of a minute. Tenth of a minute resolution is usually fine for CAP's purposes.

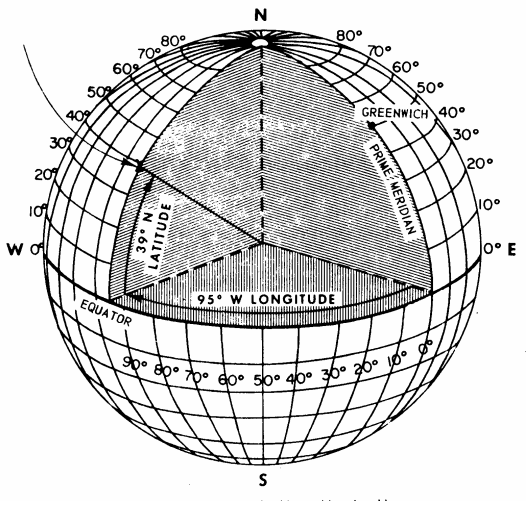


Figure 1 – Latitude and Longitude

**Latitude:**

The equator is a great circle midway between the poles. Parallel with the equator are lines of latitude. Each of these parallel lines is a small circle, and each has a definitive location. The location of the latitude is determined by figuring the angle at the center of the earth between the latitude and the equator. The equator is latitude 0º, and the poles are located at 90º latitude. Since there are two latitudes with the same number (two 45º latitudes, two 30º, etc.) the letter designators N and S are used to show which latitude is meant. The North Pole is 90º north of the equator and the South Pole is 90º South. Thus the areas between the poles and the equator are known as the Northern and Southern Hemispheres. A written example of latitude is, "36º 5.5'N".

**Longitude**

There is no natural starting point for numbering longitude. Therefore the solution was to select an arbitrary starting point. It is the meridian through the observatory in Greenwich, England. The meridian through Greenwich is sometimes called the first, zero, or Prime Meridian. Longitude is counted East and West from this meridian through 180º. Thus the Greenwich Meridian is the zero degrees longitude on one side of the earth. After crossing the poles, it becomes the 180th meridian (180º east or west of the 0-degree meridian). Therefore we have all longitudes designated either west or east, for example, 140ºE or 90ºW. The E and W designations define the eastern and western hemispheres.
A written example of longitude is, "119º 32.0'W".

**Position location:**

This system is used to precisely locate any point on the earth's surface. When identifying a location by its position within this latitude-longitude matrix, you identify the position's coordinates, always indicating latitude first, and then longitude. When a search object is found, it has to be located on the chart by other means before the coordinates can be determined.

Map reading or other electronic aids will be used to locate it on a chart or map. The Ground Positioning System (GPS) simplifies the location process by reading out the latitude and longitude of the aircrafts location.

**Plotting a Position:**

The United States is located in the North and West hemispheres. Therefore, in the United States, the latitude will always be North direction and the longitude will always be West direction. Referring to Figure 11-2, the parallels of latitude are horizontal on the chart and the lines of longitude are vertical. The entire square covers an area of 1 degree north and west as indicated by the black degree numbers in the four corners. This area would be described as 36º N and 123º W. Each vertical line of longitude is divided and marked in 1 minute units that measure the distance between the lines of latitude. For ease in counting each 5 units are indicated by a wider mark, 10 units by a mark going through the longitude line, and 30 units with a line through the entire area. There are 60 units from 36º to 37º N or 60 minutes in 1 degree.

CAP uses a grid system based on aeronautical sectional charts, dividing them into grids of 15 minutes of latitude and longitude. This results in an area of about 7 by 11 miles in West Virginia, an area that is too large to be useful for UDF or ground teams, but UDF teams should have a gridded sectional chart for their area, for reference. CAP grids are numbered, based on the sectional name (for example, LUK 123) and can be further divided into quarter grids (LUK 123 A). While it isn’t necessary for ground or UDF teams to have current aeronautical charts, they shouldn’t be too old – things do change, and looking at an old map can be confusing. Five years is probably a good retirement age for sectional charts.

As mentioned in the section on equipment, UDF teams should have several different kinds of maps available, including road maps, a topographic map such as a DeLorme atlas, and street maps. Maps that have some useable grid system (such as latitude and longitude) are much more useable than those that don’t. Electronic maps are available, but require a computer to use, and therefore are more suitable for use at a search base or by the IC.

**Reading Topographic Maps:**

Interpreting the colored lines, areas, and other symbols is the first step in using topographic maps. Features are shown as points, lines, or areas, depending on their size

and extent. For example, individual houses may be shown as small black squares. For larger buildings, the actual shapes are mapped. In densely built-up areas, most individual buildings are omitted and an area tint is shown. On some maps, post offices, churches, city halls and other landmark buildings are shown within the tinted area.

The first features usually noticed on a topographic map are the area features such as vegetation (green), water (blue), some information added during update (purple), and densely built-up areas (gray or red).

Many features are shown by lines that may be straight, curved, solid, dashed, dotted, or in any combination. The colors of the lines usually indicate similar kinds or classes of information: brown for topographic contours; blue for lakes, streams, irrigation ditches, etc.; red for land grids and important roads; black for other roads and trails, railroads, boundaries, etc.; and purple for features that have been updated using aerial photography, but not field verified.

Various point symbols are used to depict features such as buildings, campgrounds, springs, water tanks, mines, survey control points, and wells.

Names of places and features also are shown in a color corresponding to the type of feature. Many features are identified by labels, such as "Substation" or "Golf Course."

Figure 2 - Graphical and topographic depiction of terrain

Topographic contours are shown in brown by lines of different widths. Each contour is a line of equal elevation; therefore, contours never cross. They show the general shape of the terrain. To help the user determine elevations, index contours (usually every fourth or fifth contour) are wider. The narrower intermediate and supplementary contours found between the index contours help to show more details of the land surface shape. Contours that are very close together represent steep slopes. Widely spaced contours, or an absence of contours, means that the ground slope is relatively level. The elevation difference between adjacent contour lines, called the contour interval, is selected to best show the general shape of the terrain. A map of a relatively flat area may have a contour interval of 10 feet or less. Maps in mountainous areas may have contour intervals of 100 feet or more.

Elevation values are shown at frequent intervals on the index contour lines to facilitate their identification, as well as to enable the user to interpolate the values of adjacent contours.

Bathymetric contours are generally offshore since they show the shape and slope of the ocean bottom. They are shown in blue or black. Bathymetric contours are shown in meters at intervals appropriate to map scale and coastal profile, and should not be confused with depth curves.

Depth curves are shown along coastlines and on inland bodies of water where the data are available from hydrographic charts or other reliable sources. Depth figures, shown in blue along the curves, are in feet on older USGS maps and in meters on newer maps. Soundings, individual depth values, may also be shown.

**Compasses:**

UDF team members need an orienteering style compass. Orienteering compasses have a more or less rectangular base plate, and a rotating dial that houses the magnetic needle. The dial should have a mark for every 2 degrees on the housing; some will have 5 or 10 degree marks which are NOT ADEQUATE.

Other styles of compasses are either unsuitable (electronic, round, wristwatch, survival knife) or require additional equipment and different techniques (such as military, “lensatic” compasses). Perfectly adequate orienteering style compasses can be purchased for less than $10.00.

Because compasses are magnetic, they can be affected by large metal objects such as cars, power lines, or any other ferrous metal. Check yourself out and verify that nothing you’re carrying will affect the compass. When you purchase your compass, lay several out on the counter (they can be in the box), and pick one that agrees with the others – compass needles are occasionally painted wrong, and indicate south. Also, be careful if the store uses a magnetic anti-theft system, the process of deactivating the tag can ruin the compass.

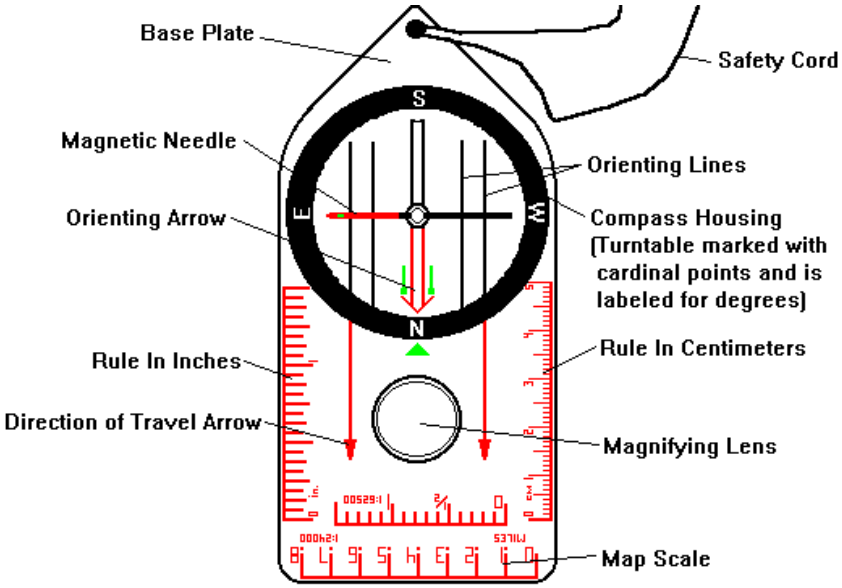


Figure 3 - Typical Orienteering Style Compass

Compasses show the direction of magnetic north, there are a couple of other north references but we will only concern ourselves with magnetic and true north.

Magnetic north is the direction to the magnetic North Pole, which is located almost 1000 miles from the true North Pole. The true North Pole is the axis of the earth; the magnetic North Pole is where the lines of magnetic force converge. Since maps typically show true North at the top, and compasses show magnetic North, a conversion must be made when switching from magnetic (compass) bearings to true (map) bearings. This is the angle difference from your location between the true and magnetic poles. In West Virginia, the conversion varies from about 7 degrees in extreme Western portion of the state to 9 degrees in extreme Eastern portion of the state. When converting from true to magnetic subtract the appropriate amount (called variation or declination) from the true (map) bearing to get the magnetic bearing. To convert from magnetic (compass) to true (map) bearings add the variation. It is very easy to mix up the bearings, for this reason it's usually better for field teams to all use magnetic bearings, and let the IC or mission base staff do the conversions. So, always specify the bearing and if it's true or magnetic.

**Following a known bearing using a compass:**

To follow a known bearing using an orienteering compass, first set the bearing by turning the compass housing until the bearing is lined up with the direction of travel arrow. Then, holding the compass level at about waist height, with the direction of travel arrow pointing in FRONT of you, rotate your entire body until the red end of the compass needle is lined up OVER the marked end of the orienting arrow in the compass housing. Look up and find a distinctive landmark that is in line with the direction of travel arrow, and then you can walk to that landmark, and repeat the process.

**Taking a bearing using a compass:**

Taking a bearing using a compass is very similar to following a bearing. Holding the compass at about waist height, with the direction of travel arrow pointing away from you, rotate your entire body until you're pointing at the object you're taking a bearing too, or in the direction you're taking a bearing. Then, rotate the compass housing until the marked end of the orienteering arrow in the compass housing is lined up UNDER the red end of the compass needle. Read the bearing on the dial.

**Converting a bearing from the field (compass / magnetic bearing) to a map (true) bearing:**

As mentioned earlier, compasses measure magnetic North while maps are based on true North. To plot a magnetic bearing taken in the field onto a map, it must be converted to true North. Based on your location in West Virginia you will need to ADD the local magnetic variation (sometimes called declination) to the magnetic bearing taken with a compass. For instance, if you're in Parkersburg, West Virginia, the magnetic variation is about 7 degrees West. If the bearing you took is 187 degrees magnetic, you would add

the variation to the bearing, resulting in 194 degrees TRUE. Always remember to specify if the bearing is magnetic or true. You can find the local variation on aeronautical sectional charts (look for curving, heavy dashed blue lines with the variation on them) or at the bottom of topographic maps:

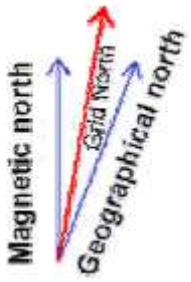


Figure 4 - Direction arrows on a topographic map

The North arrows at the bottom of topographic maps will specify the correct variation for that map, round off to the nearest degree. Geographic and True North are the same, disregard the Grid North arrow.

**Converting a map bearing (true) to a magnetic bearing for use with a compass:**

A similar procedure is used to convert a bearing measured on a map for use in the field. Take the True bearing, and SUBTRACT the variation from it. In our example above, if you have measured a bearing on a map of 194 degrees TRUE, you would SUBTRACT the 7 degree variation from it for a MAGNETIC bearing of 187 degrees.

**Measuring a bearing on a map:**

To measure a bearing between two points on a map, lay the edge of the compass on the map so that it touches both points (if necessary, draw a line connecting the two points and line the edge of the compass with it). The direction of travel arrow on the compass should be pointing in the direction you're measuring TO. Rotate the compass housing until the orienteering arrow is lined up parallel to a true north-south line on the map. Many maps have these lines as lines of longitude, the edges are also true north or south. Then read the bearing at the direction of travel arrow on the compass housing. When measuring a bearing on a map, the magnetic needle isn't used.

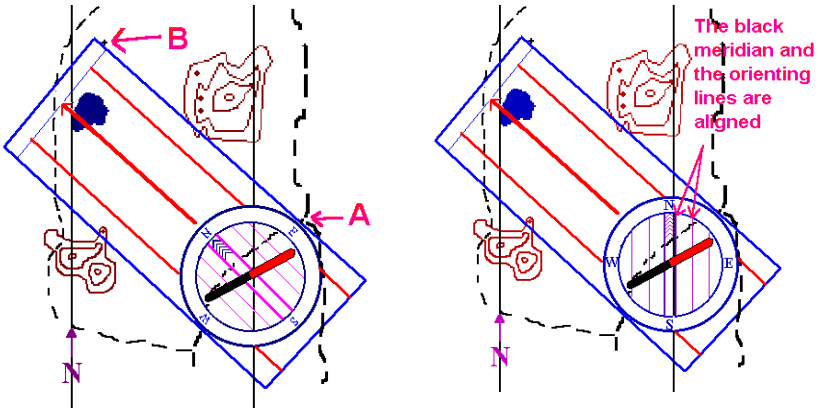


Figure 5 – Measuring Bearings on a Map
A. Line Edge on both points B. Rotate compass housing to line up with True North Line
C. Read bearing on compass bezel

**Scale and Distance:**

In addition to measuring directions, measuring distances on a map is important too. Since maps are smaller than life representations of the earth, the size of an object, or distances between objects, is smaller too. The ratio of the difference between life size and the map is called the scale.

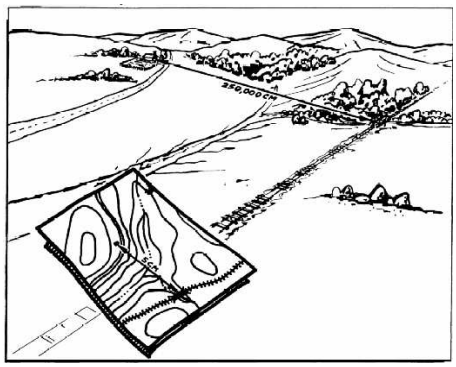

Figure 6 - Life size distance (250,000 cm) and scale distance (5 cm) (Scale = 1:50,000)

Different maps and charts have different scales. The scale is usually mentioned on the map in the margin notes, but some maps (especially road maps) may have only a scale bar.

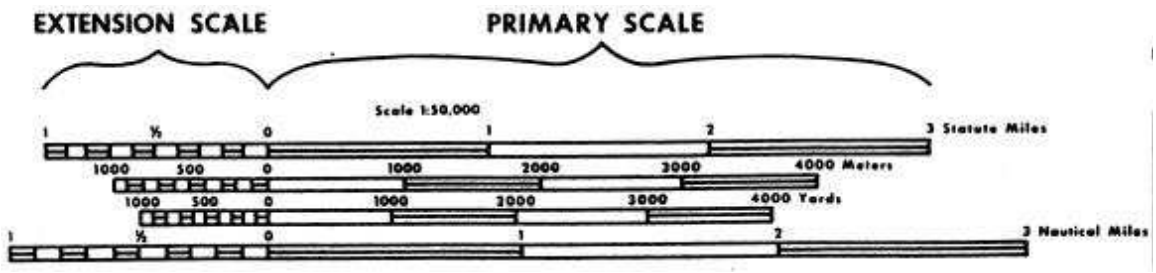


Figure 7 - Scale Bar

Certain types of maps always have the same scale. Sectional Aeronautical charts scale is 1:500,000, which is equal to 1 inch on the chart equaling 8 statute miles (7 nautical miles), a typical topographic map is 1:24,000 scale, or one inch equals about 2000 feet. Check other maps for other scales. Some scale bars have an extension scale as on the left of the example above, this divides the distance into smaller sections. If you're using a scale bar with an extension, be sure to measure to the ZERO line, not the end of the extension scale.

**Measuring distances on a map:**

To measure distances on a map you might be able to use a scaled edge on the edge of your compass, or another scale device. There are many such devices; used like a ruler they will directly indicate the distance for a given scale.

If you don't have a handy scale to measure directly, you can measure distances using the edge of a piece of paper.

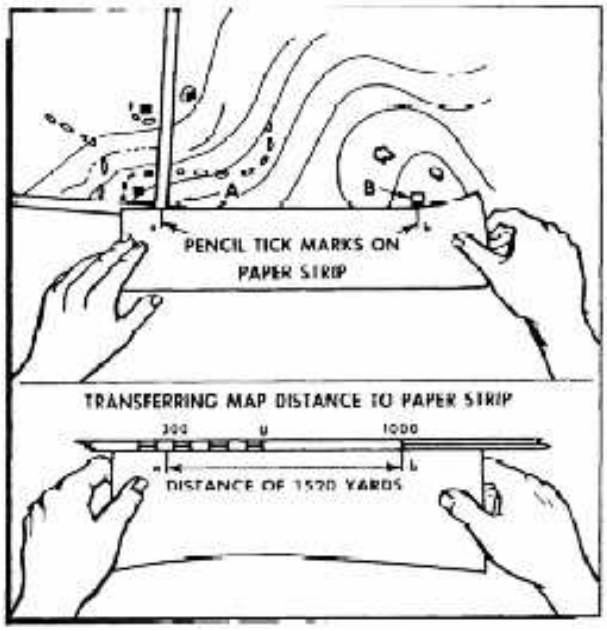


Figure 8 - Measuring straight distances

You can also use this technique to measure distances that are curved, along a road, for instance: Just lay the paper along short, straight segments making tick marks on it, turning the paper as the road turns, then measure the entire distance on the scale bar

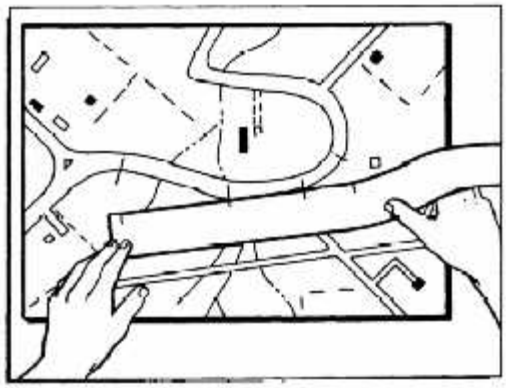

Figure 9 - Measuring curved distances

**Triangulating Bearings:**

Oftentimes in Urban Direction Finding (UDF), the actual location of an Emergency Locator Transmitter (ELT) signal may not be clear – especially if it's in a residential or industrial area. Being able to take several bearings from high points around the suspected target area will allow searchers to zero-in on the actual location more quickly than driving around and taking bearings, or listening for a signal.

In triangulating bearings, a bearing to the signal (taken with the Direction Finding (DF) unit, see below) is made, and plotted on a suitable map. Ideally, several teams can participate, each taking one of the bearings. With three or more bearings plotted, the actual location of the signal is readily seen. One person should be responsible for plotting the bearings, to minimize the chances of errors.

In the example map (figure 10), three bearings on an ELT signal were taken from three different points. Each bearing was plotted on a topographic map of the area, showing the point the bearing was taken at and the bearing direction. If the bearings taken are perfect, they should intersect at a single point, however this is rarely seen. Intersecting in a small triangle is sufficient for a UDF team to get into the area, and detect the signal, then locate it.

Taking bearings for triangulation can also show you that the target is moving (in a car, truck, etc). If a team takes a bearing, and a few minutes later another bearing shot from the same location shows that the bearing has changed significantly (more than 5-10 degrees) then it's very likely the target is moving.

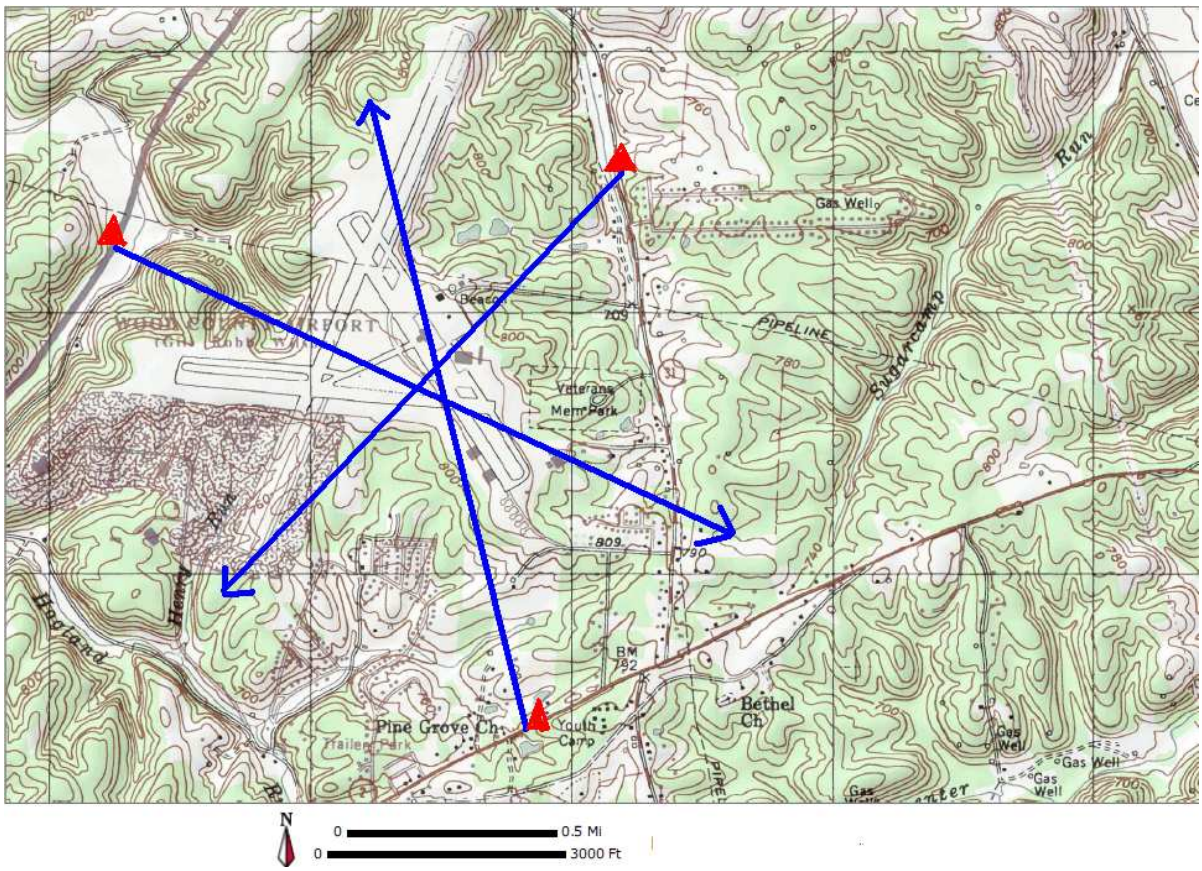


Figure 10 - Intersecting triangulated bearings on a Topographic Map

**Electronic Direction Finding:**

Explain ELT's and EPERB's.
Explain how the Signals from the ELT and EPERB are used in locating a target.
Explain the use of Ground DF equipment and how to properly use this equipment.

**Direction Finding:**

Locating and securing emergency radio beacons is CAP's main ES mission and nobody does it better. Proficiency in locating these is important for all CAP UDF and ground team members.

Emergency Locator Transmitter (ELT's) are self-contained radio transmitters that may be automatically or manually activated in the event of an aircraft crash. They have a switch that is activated by a force that simulates a crash, and transmit a signal on one or more frequencies that alert rescue forces. EPIRB's (Emergency Position Indicating Radio Beacons) are generally similar except they don't have g-switches, and are turned on either by a position switch that activates the unit when turned right-side up, or manually activated, and are used on boats rather than aircraft. See Figures 1 and 2 for typical ELT's and EPIRB's.

Figure 11 – Typical ELT's and EPIRB's

Figure 12 – Typical EPIRB's

ELT's are required on many, but not all, general aviation aircraft. ELT's are not required on jet-powered aircraft (including airliners), agricultural aircraft, and a few others, although most non-jet powered aircraft have them installed. ELT's typically are installed in the rearward most 25% of the aircraft, but may have an additional ELT located elsewhere, such as in the cockpit or in survival equipment or a life raft. Some aircraft will also have a remote activation switch on the instrument panel that occasionally will be turned on accidentally. EPIRB's are generally designed to be mounted on the outside of boats, upside down in a bracket that allows them to float free, turn right side up and begin transmitting. ELT's and EPIRB's sound exactly alike, with a downward swept tone.

While military aircraft are not required to have ELT's some do, these will typically transmit on only the military distress frequency of 243.0 MHz. They can be mounted in the aft end of the aircraft, or in fighter aircraft in ejection seat survival kits, as well as survival radios carried in survival vests. Also, packed life rafts might have EPIRB's installed.

ELT's may be either standard or new technology. Standard ELT's typically will operate on one of three frequencies. Civil ELT's will transmit on 121.5 MHz, one of the international distress frequencies, while as mentioned military ELT's and beacons will transmit on 243.0 MHz, another distress frequency. Since 121.5 MHz is one-half of 243.0 MHz, the military can track civil ELT's without special equipment, but standard 121.5 MHz equipment can't track military beacons. New technology ELT's and EPIRB's work differently, transmitting a data signal on 406.025 MHz for 50 seconds per minute, and then transmitting a very weak 121.5 MHz signal. The new technology devices are still in

their early stages of deployment, and there are relatively few new technology ELT's but we find a few. There are more 406 MHz EPIRB's.

The advantage with the 406 MHz ELT/EPIRB's is that they are much better designed (resulting in far fewer accidental activations), have much higher power (5 watts vs. .5 watts), and are detected by satellites much more quickly. The 406 devices are registered to a particular individual, so when the report is first received the owner can be contacted, and report which aircraft or boat is being looked for, some also have the ability to interface with a GPS unit and then transmit the GPS coordinates, which helps locate the device. The low power 121.5 beacon is used for final homing once the search team is in the immediate area. The 406 MHz devices are also detected by higher-flying satellites than the 121.5 / 243 devices, which results in much more thorough coverage, and more rapid detection and location of the transmitter.

The disadvantage of standard ELT's is that they have a very high accidental activation rate – in excess of 94% worldwide. Because of the design of the g-switch, accidental activations are common, yet when an aircraft crashes the ELT is often destroyed.

The SARSAT / COSPAS system. Search and Rescue Satellite Aided Tracking (SARSAT) (COSPAS is the Russian acronym for the same system) is a multi-national system of satellites that have the ability to locate and repeat the signal from 121.5 / 243.0 MHz ELT's, but because of the design of the system at least two satellite passes are needed to isolate the location of the ELT, and the satellites are on orbits that result in gaps in coverage that can be several hours long. In order for a signal to be reported, the satellite must be "visible" to both the ELT/EPIRB and the earth station, which locates and reports the signal. The US earth station is located in Maryland, and is operated by NOAA. Earth stations are also located in Canada, France, and Russia, among other countries. The position reported by the satellite is actually one of two possible locations, in order to resolve the location a second satellite pass is necessary (see figures 4 through 7). The need to be visible to both ELT and earth station results in coverage of 1800 nm radius from the earth station, with coverage of only about 1/3 of the world.

Because of the design of the 406 system which utilizes different, geostationary satellites, the position reported by the satellite is much quicker (no need to wait for an additional satellite pass), and more accurate (within three miles or so radius typically) the 406 MHz system is much more accurate than the 121.5 system, which typically results in a 15-20 mile error on location. If the 406 ELT has GPS capability the location reported is accurate within 1 mile, at which point the low power homing beacon is used.

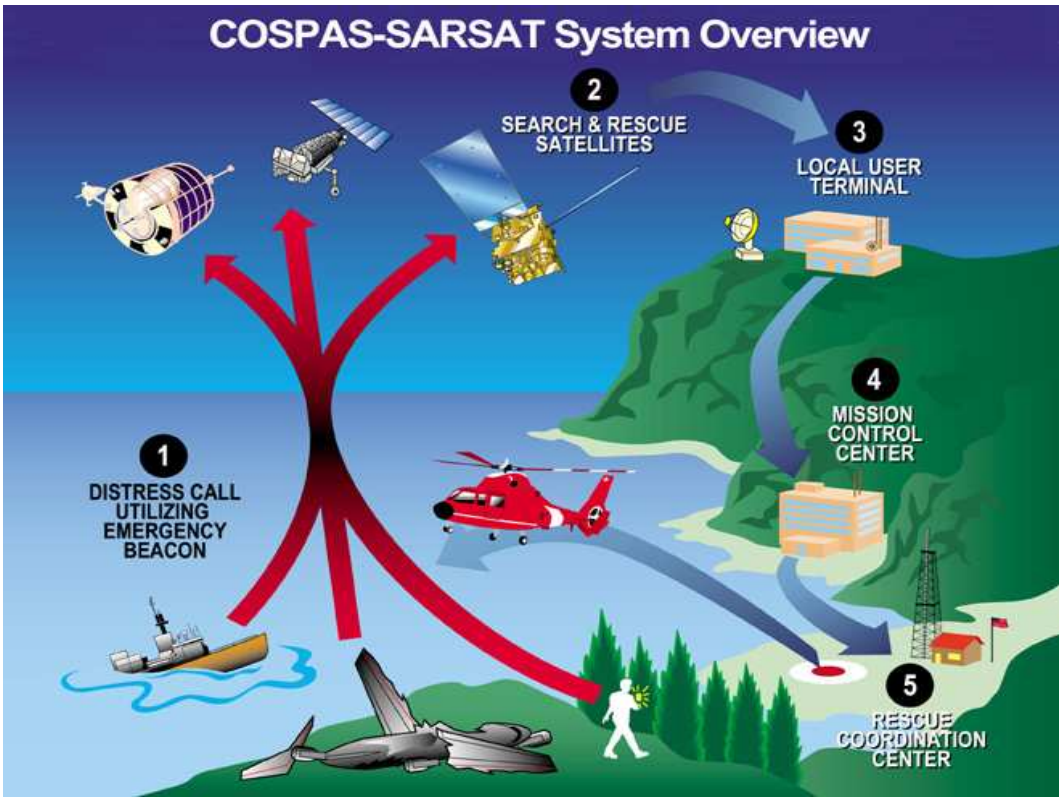

Figure 13 – SARSAT System

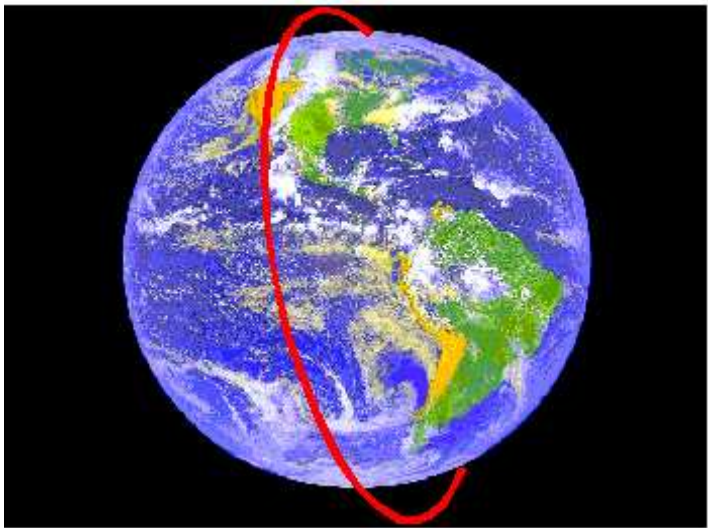
Figure 14 - Satellite Pass (Single)

Figure 15 Satellite Pass – Second

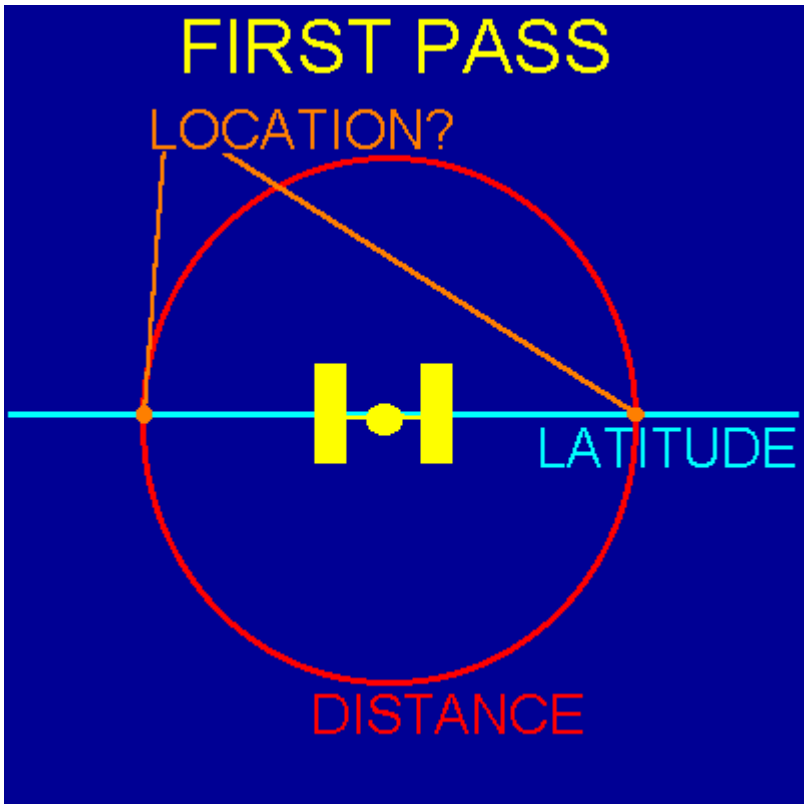


Figure 16 Resolving location discrepancies – one pass

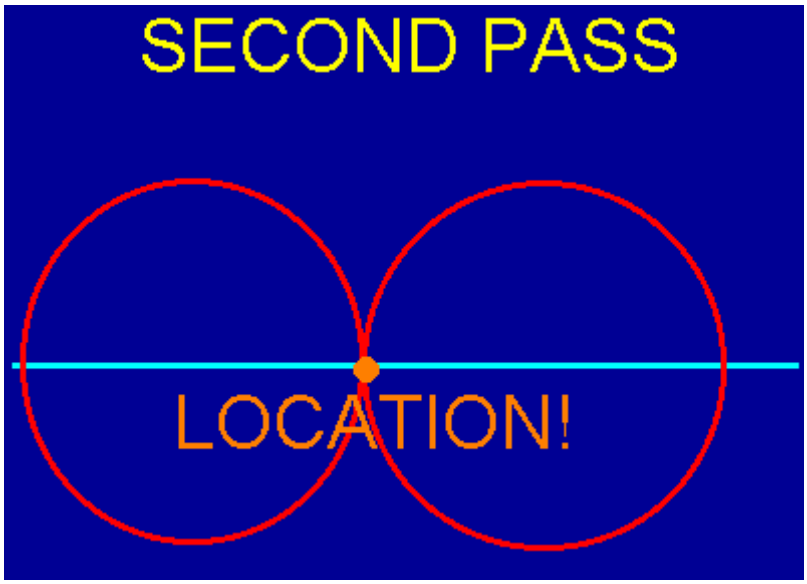

Figure 17 Resolving locations – second pass

**Direction Finding (DF) Equipment:**

The typical DF unit used by CAP ground teams or UDF teams is the L-Tronics L-Per (see figure 8). This unit is handheld, powered by two 9-volt batteries, and can be factory configured for a variety of frequencies – most are set up for receiving on 121.5, 121.775 (the practice ELT frequency), and perhaps 243.0 MHz as well. It isn't able to receive the 406 MHz signal, but can track the 121.5 homing beacon.

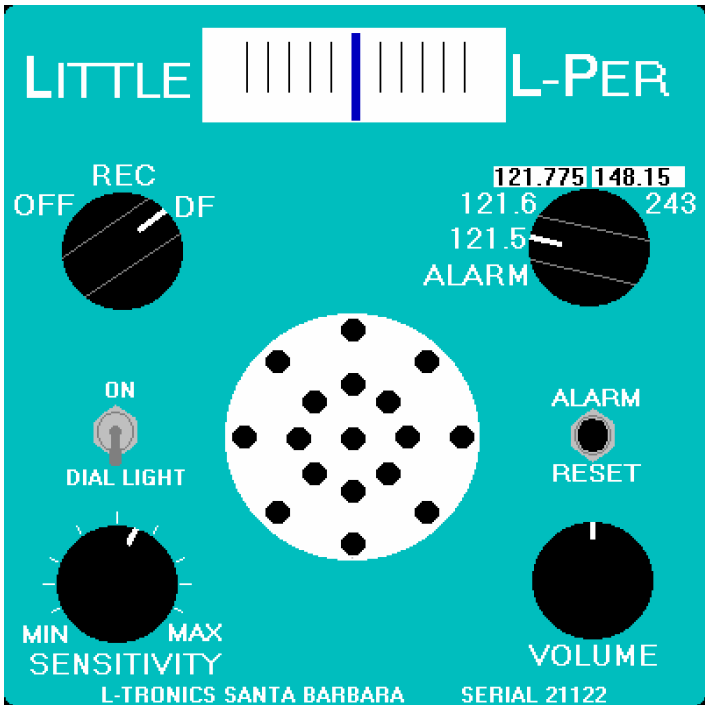

Figure 18 – L-Per DF unit front panel

Operation of the L-Per. As stated, the L-Per is operated by two 9 volt batteries which are installed under the rear cover. Once the batteries are installed, the unit is turned on using the OFF-REC-DF switch on the upper left corner of the panel. Place the switch in the DF or REC position, then adjust the sensitivity control (lower left panel) to the fully clockwise position and adjust the volume control (lower right corner) to a comfortable level. Select the desired frequency using the upper right control. The battery level can be checked by turning the light switch on, if the light turns on there is at least 5 hours of battery life left. Some units will have a battery test switch, pressing it will show a needle scale deflection showing the battery level.

The L-Per is attached to a mast and antenna by clipping the DF unit to the screws on the mast, and connecting the coaxial cable to the connector on the DF unit. The antenna crossbar is extended with the aluminum antenna elements extended and held vertically (see figure 19).

Figure 19 – L-Per DF unit mounted on antenna mast

Once the antenna is extended with the DF unit in the “DF” position hold the mast vertically, in front of you (figure 19) and with the L-per front visible and rotate it by turning yourself around until the meter needle centers (it may be necessary to turn the sensitivity control down to get the meter to move). Once the meter is centered, the ELT/EPIRB will be either directly in front of or behind you, to resolve this discrepancy switch the control to the REC (Receive) mode, and rotate until the meter shows a maximum right-scale deflection (it may be necessary to adjust the sensitivity control again). The arrow on the antenna crossbar will point to the transmitter (see figure 20).

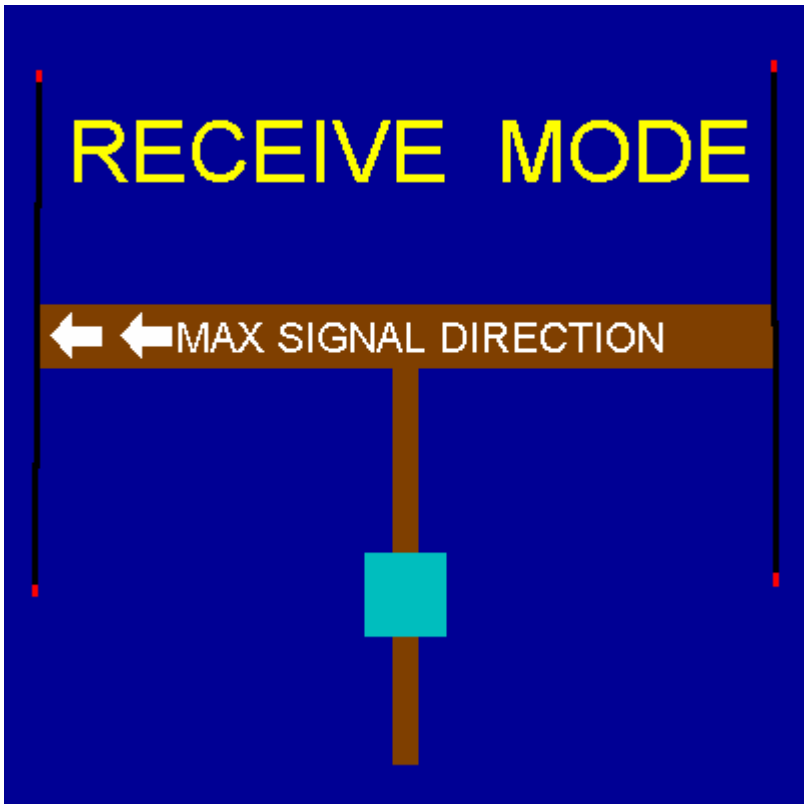

Figure 20 – Max Signal Arrow on L-Per Mast

**Monitoring the DF unit while moving:**

It's essential that UDF teams monitor the DF unit while traveling to and from the suspected search area. Attaching the DF to an external antenna and keeping the volume sufficiently high to be able to hear a signal will prevent driving right past the signal, as often happens. The antenna used doesn't have to be big or sophisticated, any sort of a temporary antenna such as a magnetic mount antenna used as a backup for other radios is fine – you just need to be able to listen.

Dedicated, external mount (permanent or magnetic) antennas are available for the L-Per. These antennas, when set up correctly, will show left/right sensing on the L-per from inside the vehicle. An additional set of antennas that will show front/rear and left/right sensing is available, if desired.

**Triangulating a bearing:**

Once you have DF'd the ELT, you can use a compass and take a bearing in the direction of the signal. With your known position and a map you can extend a line, and with another bearing from another location get an intersection where the bearings cross (see Figure 21). This triangulation technique is helpful when the signal can only be heard from certain areas.

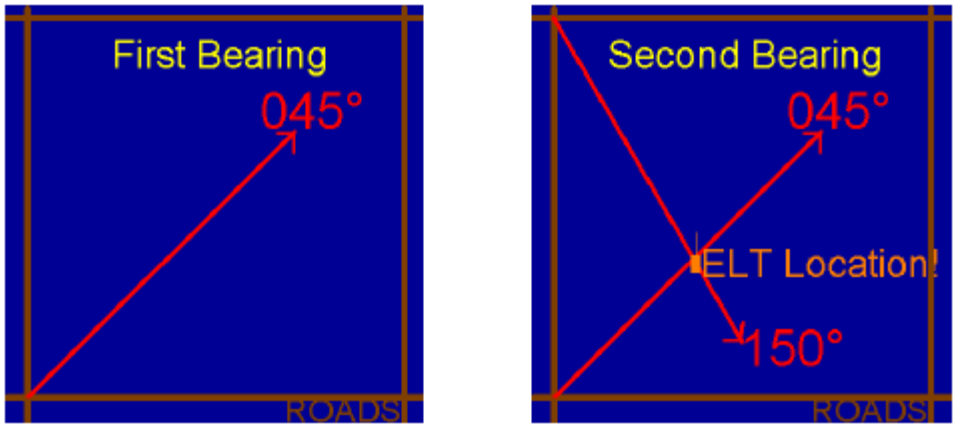

Figure 21 – ELT Bearing Triangulation

Sometimes you can get a needle deflection without hearing a sweep tone – this may be caused by a carrier only transmission, or a defective ELT (damaged, weak batteries, etc.). You can still DF on these, using the deflection received.

ELT's are line of sight transmissions – they can be blocked by buildings or mountains, the signals can also be reflected by them. If you're receiving a non-uniform or erratic signal you might be receiving several reflected signals. ELT signals can also be reflected by power lines, fence lines, or boat rigging and masts.

Sometimes it's difficult to locate the ELT when you're close to it. Turning the sensitivity down helps, if that still doesn't work you can tune the DF unit to a different frequency (such as 121.6 or 121.775) and get closer. You can also attach a standard "rubber duck" antenna to the DF unit and hold it behind you, using your body to shield the signal. This body shielding technique can also be used with other radios like aircraft band or ham handhelds, while it isn't good for long-distance DF'ing it works close-in.

Once you're at the airport or marina, notify security or the harbor patrol – they can be helpful in getting access, and will want to know who's wandering around the area. If you think the ELT may be in a private residence, notify the IC and request they call the appropriate law enforcement agency to assist you – especially at night. Never approach someone's home unannounced, they may have stolen the ELT or EPIRB. Wait in the area for law enforcement assistance, but try to have it narrowed down to the correct house. When you've discovered the hangar or airplane the ELT is in, notify the IC and the airport security, when you have found the boat in a marina, notify the IC and harbor patrol.

Figure 22 – Body Shielding

Once you've found the ELT, notify the IC and note the time. We try to turn them off if we can, either by notifying the owner or operator of the boat or airplane. Remember, CAP members have no authority to break into any boat, airplane, home or hangar to secure an ELT. If in doubt, discuss with the IC. Techniques used in the past to secure ELT's (such as removing antennas, grounding antennas, placing an aluminum foil tent over the antenna, etc) should NOT be used, they may damage the ELT or aircraft. Never tape anything to the aircraft, when the tape is removed the paint may come with it, and we don't want to pay for a paint job.

If you can get access to the ELT or EPIRB ,legally shut it off and verify you've secured the right one. If placing the switch in the OFF position doesn't turn it off, it might be necessary to remove the battery pack. This often requires a screwdriver. Once the battery is disconnected again verify the signal has stopped, and leave the ELT with the owner or operator. If the owner or operator has given us permission to enter the boat or aircraft and secure it, leave the ELT visible in the aircraft, with a note stating the time and date it was secured, the mission number and the phone number for the RCC (800-851-3051) so the owner can get additional information if necessary.

If access to the ELT isn't available, try to leave a note on the aircraft where the pilot will get it (near the door lock is a good choice, but never tape it down!), with the same information. You shouldn't leave personal information about yourself (such as name, home phone, etc), if the owner wants to get in touch with someone the RCC has the IC's number.

The IC and the RCC will want some information as well – the make and model of the aircraft or boat, the registration number (N-number, CF number, etc), the time it was secured, the location (the GPS is handy for the location), and if possible the make and model of the ELT, the serial number, the battery expiration date (which should be on the

ELT case), and the switch position. Write this all down in your notebook, you can tell the IC later.

**Conclusion:**

Now it is time to take the written test which can be found at XXXX . After passing the test, present the certificate to your unit commander and he/she can enter into the eServices that you have completed the Familiarization and Preparatory Training tasks. At this point you can start your Advanced Training under the direct supervision of a qualified trainer / SET qualified Ground Team Leader.

# SECTON VIII.

## *SEARCH AND RESCUE INCIDENT CYCLE:*

**OBJECTIVE:**

At the completion Section VIII, the ground team member will be able to:

- Identify the four phases of the Search and Rescue Event (The Incident Cycle). Locate, Access, Stabilize, and Transport.
- Explain the steps in the Locate Phase.
- Explain “Tactics.”
- Explain Passive Techniques
- Explain Active Techniques’
- Explain levels of thoroughness, Type I Search, Type II Search, and Type III Search.
- Explain the Access Phase.
- Explain the Stabilize Phase
- Explain the Transport Phase.

**LOCATE:**

After the first notice of missing person, an overdue aircraft or an ELT, the person taking the information must know to do and whom to call next.

The Civil Air Patrol is usually tasked by the Air Force Rescue Coordination Center and the Office of Emergency Services. An Incident Commander is then assigned.

Information is gathered and a plan formulated by the Planning Section (under the IC system). The information gathered is called Planning Data. It includes any information that might effect what should be done to resolve the situation. Planning Data includes the name of the subject, the subject’s age, and physical description, last known position, habits and any other information useful. Also included in the planning are resources. Intelligence gathering continues throughout the Incident Cycle.

During the locate phase of the incident, emphasis is placed on searching for the subject. Search Activities.

**Hasty Search:**

The Hasty Team is a well-trained, highly mobile and self-sufficient team of two to three team members. Their search is very specific. Typically the members are knowledgeable in tracking; they are clue conscious, familiar with the local terrain, and self-sufficient. Typically the team is made up of a qualified Ground Team Leader, a Communicator, and a Medic (qualified Emergency Responder or higher).

Many searches are resolved via Hasty Searches. Examples of areas searched (Hot Spots).

- Trails, fire roads, or other access points to the area of high probability.
- Streams, rivers, drainages, lake edges, and other run off points.
- Routes towards known gathering places.
- Known places visited by the missing.
- Common aircraft accident sites.
- Other logical places the missing might go.

The Hasty Team will carry all of the equipment they would probably need to help themselves and the lost subject.

**Active Search Tactics:**

- Type I, (Speed).
- Type II, (Efficiency).
- Type III, (Thoroughness).

**Type l, (Speed):**

High probability areas are quickly searched to locate the search subject and gain information. Example: Hasty Search. (see above).

**Type II, (Efficiency):**

Rapid search of a larger area. Example: Search Line.
Search Line: May include 3 to 7 skilled searchers. A specific interval, direction, and speed, are determined by the team leader. As a team member, you must maintain the direction and interval, and speed, you must maintain this direction and your interval while moving through varying terrain in order in order to ensure an efficient search.

The interval between members is defined as the number of team members to your left and right you must remain in sight. For a very spread out search, the team member will specify that you only need to see one person on the left and right. For a very concentrated search, you might be told to keep two or three people on each side within your sight.

The search line also has direction of movement. This is determined by guiding on something such as a compass azimuth, a terrain feature like a road, or marked line left by the team's last sweep through the area. One team member will normally be designed as the base team member. He or she is responsible for maintaining direction. This will normally be the person at the end of the search line, following a terrain feature or marked route. In very spread out searches (with an interval of one person on either side in sight), it is probable that all members of the team might be given the compass azimuth to follow.

Search lines move as fast as the slowest searcher. Some parts of the search area might be harder to search or be more difficult to travel through. The team should always slow down for the slowest searcher, not make that person speed up and miss a clue.

Search lines do not need to be silent. Talking is permitted between team members on your left and right in order to maintain proper interval, direction and speed. Conversations should not be idle chit- chat, but conversation necessary to complete a thorough search.

To move forward as part of a search line know the appropriate interval, direction, and the location of the base team member (to your left or right).

As you move, space yourself so you can barely see the number of team members on either side specified by the interval.

If the terrain changes and you cannot see the required number of team members, move towards the base. If you cannot see the persons farther away from the base than you, then advise them to move in as well.

Maintain proper direction either with your own compass (if specified) or by observing the team member closer to the base member than you.

You do not have to keep an absolute straight line as you walk. You can move about in order to effectively search all the terrain, as long as you maintain the appropriate general direction.

Try to stay on-line with other members. If they stop, you stop.

Do not rush to catch up. If it is taking longer to search the area you are in, have the other team members slow down.

Any team member may halt the line for safety or a possible clue/find, but only the team leader can forward the line.

**Type III, (Thoroughness):**

Search with highest probability of detection. A slow, highly systematic search using the most thorough techniques to provide the highest probability of detection.

Closed grid or sweep search with small-between-searcher spacing; searched areas often overlap adjacent teams for better coverage.

Usually four to seven searchers, including both trained and untrained personnel or trained grid search teams.

**Communicate To Other Members Of The Search Line:**

The primary means of communications within a search line is verbal. Since a team is spread out over a large search area, not everyone can hear everyone else. To solve this problem, team members rely on the leader's commands and member reports to other members of the team who are further away from the speaker or whistle signals are utilized to relay a command or a report.

Immediately obey the command. (If you hear "Halt The Line, then halt immediately before relaying the command.)

Determine from which direction the command comes.

Repeat the message exactly, shouting it in the direction of team members farther from the speaker than yourself. If you are sure that there is no one farther from the speaker than you, you need not repeat the message.

To send a message, shout your message toward where you believe the team leader is. Listen to ensure that the team members on either side of you have relayed your message appropriately. If no response is heard, repeat your message until the team members at your side do so.

**Whistle Signals:**

Whistle signals are used to transmit commands along the search line, or whenever team member are separated too far for voice communications.

Normally, team members do not repeat whistle signals that they here. This can cause confusion. However, if you believe the signal can't be heard by some members of the team, repeat the signal you hear.

The whistle signals are:
1 short blast----------Forward the line (team moves forward).
2 short blasts----------Stop the line (team stops). If you are moving and hear only one blast, stop anyway.

3 short blasts----------Help or danger signals (Stop immediately).
1 long blast----------Assemble on the signal origin (the person blowing the whistle).

**Conduct Attraction Techniques:**

Attraction techniques are methods used to make it easy for the missing person to find you.

If the target of a search is conscious, it is advantageous to let the target know you are in the area. That way, even if you don't spot him/her, he/she may signal you. This is done by conducting "Attraction Tasks," basically being visible and early heard. By day, noise is the primary attraction. At night, noise and light are effective.

**Sound Attraction Techniques (usable day or night):**

- Shouting
- Honking automobile horns during route search.
- Use a public address system

**The sound sweep:**

On command from the team leader, the team halts and all members blow their whistles for 15 seconds. After blowing the whistle, the team remains stationary and silent for one minute listening for a response.

**Light Attraction Techniques (usable at night):**

- Build a bonfire (when stationary for long periods). BE CAREFUL NOT TO START A WILD FIRE! Fire can get away very easily!
- Hang light sticks in trees. Make sure you collect them on leaving.
- Shinning flashlights. Avoid blinding team members. If you are searching without lights, use a red or blue lens for an attraction light to avoid night blindness.
- Use car headlights during vehicle search (watch your battery).
- Hand signs that direct the lost person towards your camp or base. Also can be used to direct the lost person to remain there.

**Containment Operations:**

The purpose of containment operations is to limit the size of the search area by surrounding it with searchers so that if the target tried to move out of the area, a searcher will spot him/her. Containment Operations are often used early in a missing person's search, when the search target is considered to be conscious and mobile. Your team may be given an area of ground to contain, or may be told to contain one or more sides of an area (for example, along a major road or trail). One important part of containment operations may be attraction (see above). Searchers should do everything they can to

draw attention to themselves and make it easier for the target to find them. This includes making noise, calling the targets name, and lighting a fire (IF SAFE TO DO SO).

Containment operations should almost always be supplemental by normal search techniques, such as a hasty search. In this way, in the case where the target is not mobile, there is still a chance that team members searching through the area will find him/her. Containment operations require you to spread your team members out in order to cover the assigned contained area. You must assure your team member's safety by not isolating anyone, or leaving someone without adequate food, water or protection from the elements.

**Planning and Organizing Containment Operations:**

Define the area of the containment area. Draw a line on the map of the perimeter. When possible, use clearly identifiable linear terrain features (such as roads, streams beds, power lines, etc.). Study the terrain. Initially, you can do this on a map, but always verify your map study when you actually arrive on site. Maps are often out of date, or not detailed enough. Look at the terrain both from the point of view of the target (Where is he likely to go?) and that of your team (Where can you best observe the perimeter?). Use the acronym COOKIE as you study the terrain.

| | |
|---|---|
| **C -** Concealed areas: | Areas such as ravines and depressions where individuals cannot be easily seen or detected. You will make sure these areas are covered. |
| **O** – Observation: | Determine what areas you can see, and where the best places are to put people where they can observe from. |
| **O** – Obstacles: | The places he/she are least likely to travel through to leave the area? These are normally difficult terrain such as cliffs, heavy briers, lakes, etc. These are areas you put less effort into the watching. |
| **K** - Key terrain features: | Things that are likely to draw the target's attention, such as roads, houses, fences, etc. You will want to make sure you can watch these. |
| **I** – Incident: | Areas that are known trouble spots or that provide good results on previous incidents. |
| **E** - Exit. | Roads, paths, and drainage areas that a missing person might use to exit the search area. Focus on these areas. |

Determine the hazards in the area, so you can brief your team.

Decide the techniques to be used and where to position personnel. The best possible solution would be to position two-person teams all the way around the perimeter where each team can see the teams on its right and left, and every inch of the perimeter is observed, and all teams have radio communication with the team leader. Teams will be assigned to various tasks from manning look out posts or trail or road blocks, putting up string lines, or checking/makings track traps. If there are not enough resources, you should you can use some or all of the following techniques.

The buddy system is used and no person is sent out alone. You can spread out buddy pairs as long as each can see the other at all times. The teams are positioned to observe all avenues of exit, and as much of the perimeter as possible. Use of roving patrols, teams that move along the perimeter looking for the target. The use of vehicles is also used.

Placing signs in areas where the target person is likely to be, especially if you can't cover that area visually. A sign at a fence line or prominent point can direct a missing person toward your team. The use of an arrow can be used "This Way to safety". Tape and string can also be used. Each section should have radio communications with the team members. If radio communication is not available, whistles can be used temporarily.

**Plan attraction tasks:**

Signaling devices can be used. Whistles, fires (if allowed and safe), horns, voice, etc.

A communication plan needs to be made. How do teams communicate? Make sure teams are always able to communicate, at least in whistle range of each other.

Determination of lost communications/emergency procedures needs to be made. It is important to know where to go in an emergency. Briefings should be done. They should include the results of planning each team needs to know where to go and what to do.

**Team briefing should include:**

- The chain of command for the team.
- Who is in each section, and who carries what team gear.
- Exactly where each team should go and what each team should do.
- Hazards and lost communications procedures.
- Action to take on clue or target finds.
- Where the team leader is located.
- The target description.
- Attraction techniques.
- How long is it expected that the team will be performing the containment operations.
- Equipment necessary in the containment exercise.

**Scanning Techniques While on Foot:**

Searching systematically is the mission of the ground search and rescue team members accomplishing this by scanning their assigned search sector systematically to ensure that the entire area is covered. Night scanning is similar to day scanning, but relies more on peripheral vision, which is more effective than direct vision in limited visibility conditions.

The following rules apply to individuals moving as part of search line or team:

- Scan the entire area in front of you from left to right and then from right to left.
- Observe areas blocked by foliage or terrain that should be investigated closely.
- Look down at the ground close at hand and up in the tree branches for clues.
- As you move through the woods investigate the areas that were blocked by foliage on your initial scan.
- Remember that clue-conscious is critical. Look for the clues that will lead you to the target, not just the target itself.
- Occasionally stop for a moment and listen for clues.
- Turn around and observe the area behind you for clues that could have been missed as you passed through.

Individual searchers do not need to maintain an absolutely straight line when moving through the woods. Move around as required to investigate and search the entire area. Ensure that you know and maintain the team's base direction of movement.

At night, the following additional rules apply:

- Do not stand at any one spot too long.
- Do not use white light (unless conduction a full light search).
- Avoid white light for 30 minutes prior to the search to give your eyes time to adjust. If you are moving to the search site by vehicle, make sure the overhead dome light is off.
- Be especially alert for movement or noise.

**Mark a Route:**

Route marking is very important when searching. If the team marks the edges of the area it searches, it can ensure that it doesn't miss or double cover the area and terrain. Marking can also be important in other situations, such as marking the route to an isolated crash site in order to assist emergency workers in getting to the site.

Normally a team marks both left and right sides of the area it searches unless:
One side of the search area is a clearly definable terrain feature, such as a road, stream, or edge of the forest. One side is already marked from the teams' previous pass through the area.

**To mark a route:**

Determine what color of marking tape to use. It is best to use a different color for each end of the line. Also, to avoid confusion, ensure the area does not already contain old markings in the same color. As you walk, tie a band of surveyor's tape at eye level around trees, fence posts, or other features. If moving through a field, use the highest plant you can find. Ensure the tape is visible from all directions. Place tape at intervals where you can always see the next band from the previous one in all directions. Tie bands more frequently in areas where the visibility is restricted. Slow the search line down as necessary in order to have time to leave good markings. Do not get in a hurry and do a poor job.

**Identify Missing Person Search Clues:**

Searching for a missing person is an exercise in locating clues that will lead you to the location of the subject. These clues are found by conducting ground searches, air searches, and witness interviews.

**Ground team members on searches in wilderness areas should look for the following:**

- Physical clues.
- Pieces of clothing or equipment.
- Smoke, by sight or smell.
- Food wrappers or trash, cigarette butts.
- Broken or disturbed trees and underbrush.
- Presence of scavengers (vultures, wolves, etc.).
- Signs of human passage or occupation.
- Odors, such as decomposition.

**Recorded Clues:**

- Trail registers
- Sign-in logs

**People:**

- Witnesses
- Family and friends
- Signals
- Falling rocks
- Unusual noises

Missing people are considered to be clue generators. Rarely can any person travel through, or be in the woods without leaving signs of their passage. Clue-consciousness on

the team member's part is critical. Do not look just for the missing person. Look for the clues that lead you to the subject.

**Identify Aircraft Search Clues:**

1. Searching for a missing aircraft is an exercise in locating clues that will lead to the location of the aircraft. These clues are found by conducting air and ground search, airfield searches ("ramp checks"), and witness interviews.

2. Ground team members on searches in wilderness areas should look for the following:
    a. Changes in terrain:
        1) Broken or disturbed trees or underbrush.
        2) Landslides.
        3) Horsetails caused by windblown snow or sand.
        4) Breaks in terrain.
        5) Blackened or discolored areas.
        6) Smoke.
        7) Presence of scavengers (vultures, wolves).
    b. Smells:
        1) Smoke
        2) Decomposition odors
        3) Fuel, oil, or brake fluid.
    c. Signs of the Aircraft.
        1) Pieces of wreckage (twisted metal, seats, parts, etc.).
        2) Fuel, oil, or brake fluid.
    d. Signs of the Pilot/Passenger.
        1) Bits of clothing or personal effects.
        2) Trail markings
        3) Footprints
        4) Campfires
        5) Garbage
        6) Signals (mirrors, etc.)
    e. Unusual sounds (voices, creaking metal).

3. Downed aircraft do not usually come down intact and do not usually look like an aircraft. You are looking for signs of an aircraft. Recognition and detection of clues to the aircraft location is critical. In training, looking at actual crash sites or pictures of crash sites is very helpful.

**Individual Actions on Locating a Clue:**

If an individual team member spots a clue relating to the search objective (missing aircraft or person), the primary concern is to relay this information to the mission base, and to protect the integrity of the clues found. The mission base can then re-prioritize search resources based on the new information. Clues are found during ground searches, ramp checks, distress beacon searches, and witness interviews.

The actions taken by the individual team member finding the clue would be the same no matter what the source of the clue.

1. Halt in place. On a ground search, immediately call “Halt the line” and ensure that the search team stops in place.
2. Alert the team leader of the possible clue find and your position on the line.
3. From your position, visually survey the surrounding area for safety hazards such as falling tree limbs, falling rocks, and wreckage.
4. Do not disturb anything in the area or disturb the clue in any way. If it is clothing, do not pick it up, as your scent on it will interfere with search dog resources.
5. Brief the team leader on what you see and any safety hazards when he/she arrives at your position.
6. In the woods, secure the area around the clue with marking tape to keep others away from it.

**Conducting Individual Actions On Finding The Target:**

1. At the point when an individual team member first sights the object of the search mission, the search phase ends and the rescue/recovery phase begins. In this process, the safety of the search object, the individual team member, and the team as a whole is a primary concern.

2. The action an individual takes is the same for a missing aircraft or a missing person search.

a) Halt in place. Immediately call “Halt the line” or use the appropriate whistle signal to halt the team and insure the search team stops in place.
b) Alert the team leader of a possible find and your position on the line.
c) From your position visually survey the surrounding area for safety hazards such as falling tree limbs, wreckage, etc.
d) Brief the team leader on what you see and any safety hazards when he/she arrives at your position.

Follow the instructions of the team leader.

**Working with Canine Search Teams:**

CAP will often work with Canine search teams, including those of police and volunteer agencies. Dogs are especially useful in missing person searches. CAP ground teams must know how to work with the dog team without interfering with the dogs search abilities.

Search dogs fall into three categories: Tracking, trailing, and air-scenting.

**Tracking dogs:**

Tracking dogs are trained to follow a specific scent and are not necessarily affected by other humans. An article of missing person's clothing is held under the dog's nose until he gets the scent. The dog is then capable of tracking that scent on the ground through the woods to the missing person. They can be confused by additional scents that mask the target scent. These dogs may be confused by a broken track. For this reason this type of dog is deployed early in the missing person search, .i.e. before the target scent fades or the search area is filled with other search resources.

**Air-scent dogs:**

There are specialized air-scent dogs for underwater, avalanche, cadaver, drug, and weapons searches. The rules for working with any specialized dog teams are the same. Air-scent dogs are deployed downwind of the search area and are trained to detect human scent traveling on the wind. These dogs may also work at times in the tracking or trailing mode. These dogs are usually the preferred resources

**Trailing dogs:**

Trailing dogs are similar to tracking canines, but pick up scent that originates in addition to the original track. Such as when a person brushes against items and leaves a trail of dead skin cells and other items which have fallen off the body.

Search dogs and their handlers are highly trained search resources. The dogs are not always considered friendly or as pets. Search dog teams have approximately 50% to 80% probability of detection (POD).

The five rules for working with dog teams are:

1. Coordinate your team actions with the dog handler.
2. Clear the upwind search area of any personnel and stay downwind of the dog and handler.
3. When searching or traveling with an air-scent team, keep a good distance behind the dog and handler.
4. When in doubt, follow the instructions of the dog handler.
5. Unless the handler specifically allows it, keep all personnel away from the search dogs in the field. Do not allow anyone to feed or play with the dogs. Keep all vehicles away from the dogs, as the exhaust fumes deaden the scent and sense of smell. Do not smoke around the dogs.

## SEARCH BY VEHICLE

Besides being a mode of transportation the vehicle is also used as a search platform. As with search aircraft, the vehicle and personnel are an important part of the search team.

The search vehicle can also become a liability in the mission if the Ground Team Members are not vigilant in safety. Following safety procedures is a must.

- Ground teams should search by vehicle while moving to and from their assigned search area.
- Organization of the vehicle search team. The driver and navigator should be determined and assigned. Their responsibility is to operate the vehicle, not to search. The team leader or senior occupant usually makes this determination.
- Assign all team members to their seats.
- Give each team member a search sector to cover. Do not include the driver or navigator. Assignments depend on the number of team members.
- Ensure all windows are clean and clear of obstructions.
- Ensure all personnel are wearing seat belts, driver's responsibility, and team leader checks.
- Make sure all personnel know what they are looking for.

**Rules for scanning:**

- Each team member will be assigned a sector to scan. A sector of observation. Example: The person in the back right seat might be told to search from the front right fender to the back right fender.
- Scan the entire sector from left to right and then left to right. From near to far and far to near.
- Observe vehicle safety: keep your seat belt fastened, and do not distract the driver.
- Do not distract other team members who are also scanning.
- Remember that clue-consciousness is critical. Look for clues that will lead to the target.
- Let the driver know if he/she is driving to fast to adequately search your area.
- If you think you see a search clue or search target, let the team leader know. Do not shout and startle the driver.

**Night Search:**

More vigilance is needed both for safety and for search. The scanners field of vision is normally much smaller. It is much more difficult to distinguish colors causing objects to blend in. Eyes get tired. Blinding headlights from other vehicles affect vision. Drivers may become tired. As with Aircrews observe duty days and rest periods.

**Working with Aircrews on search activities.**

Working with Aircrews can be challenging, productive and rewarding. Aircraft can move quickly to a distant search site and cover a lot of search area in a short time.

Teamwork and cooperation is important to achieve the goal of finding the intended target and moving on to the access phase of the mission. Often times in a search activity the Aircrew does not understand all of the problems associated with ground search and Ground Team members may not understand all of the problems associated with the air portion of the search. Often, aircrews do not see that terrain can be difficult to navigate to a target area. Ground teams may not understand that not all terrain features can be determined from the air. Often, communications is difficult for aircrews because of the multi-tasking that must take place by the pilot and observer.

Safety is paramount for both Ground Teams and Aircrews. If the requests from each other's counterpart may cause a possible unsafe situation, cooperation to find a satisfactory alternative should be sought. Confer with the Ground Ops. Or Air Ops. Directors if questions should arise.

Communications is often difficult and un-necessary talk on the radio should be avoided. The proper use of communications procedures should be maintained at all times.

Ground teams should carry current road maps, DeLorme’s, etc. ground teams should also have girded Aeronautical Sectionals so they can coordinate with aircrews. Most pilots have expired, but fairly current Aeronautical Sectionals. They will usually give them to you for gridding). Know the basics of the Aeronautical Sectional. Become familiar with the grid system. Become familiar with normal aircraft search patterns.

**Air to ground and ground to air communications:**

Communications between ground teams and aircrews is a very important part of search activities. The usual method of communication would be radio communication. Radio could fail and other methods of communication could be needed to complete the intended outcome.

**Ground to air signals:**

Paulin Signals. Paulin signals should be as large as possible with sides 6 to 12 feet Long. The sides should be of opposite and contrasting colors, normally blue and yellow. The Paulin should be laid in a clear area and against a background that will not blend Into the Pulin colors. (see attachment 3.)

Ground-to-Air Emergency Code distress signals. There are standard ground-to-air emergency code distress signals. They should be as large as possible, 2-3 feet wide and 6-12 feet long. The colors should be contrasting to the background. Some of the signals are

used by survivors and others enable ground teams to communicate with aircraft on their findings and intentions when radio contact is not possible. (see attachment 4.).

**Air-To-Ground Signals:**

In order to acknowledge messages sent by ground personnel or survivors, standard aircraft acknowledgement signals have been adopted. These signals may be augmented by message drops (if necessary to effect lifesaving measures) if direct radio communication has not been established. In addition to these signals, several others are used to "lead" ground personnel from the air. When wanting the ground team to follow, the pilot circles the point team and head in the direction to be taken. When turns are necessary, the pilot circles the point of the turn until the team arrives, then head in the new direction. The pilot circles the object until the team arrives.

The aircraft is yawing: Negative; No.
The aircraft is pitching: Affirmative; Yes
The aircraft rolls (rocks the wings): Message received and understood.
The aircraft makes a complete circle to the right: Message Received But Not Understood. (see attachment 5.)

**Access Phase:**

After the target has been located the access phase begins.

Great care must be exercised in the access phase of the mission. Safety is of the most importance.

The access to a target can be varied and it is beyond the scope of this home study course to give detailed instruction in the possible varied access situations.

It does not take much to get "in over your head", don't do it! Many access situations can take experience and technical training. Some situations are best left to the professionals.

As a ground team member in the Civil Air Patrol, you are required to obey all laws including, traffic laws, speed laws, and trespassing laws. There are exceptions to trespassing laws in the event entry is required in life saving situations. These will be far between. Every effort should be taken to get permission for entry onto private property. Contact the property owner if possible, or contact local law enforcement. If unable to contact the above, seek counsel from the ground team leader, Ground Operations Director, ultimately the Incident Commander will make the determinations. Driving off road can be tricky and dangerous. If you are driving, make sure you are skilled in off road driving. Know your limits! There are good courses available in off road and four wheel vehicle driving, seek out these courses. As a ground team member you could be involved in many different types of search Activities, become proficient in search and rescue techniques. There are several members in the West Virginia Wing that are well trained

and experienced. Take advantage of their experience and go out with them on SAREX's. Take advantage of training.

**Approaching a site (Missing person, downed aircraft, and possible crime scene):**

Again, SAFETY!! Make sure the site is safe for you and others that may be present, including the search object. Life takes priority, then property. Protecting the integrity of the scene is important. Do not move anything unless it must be moved to save a life.

In taking care of injured or sick persons, stay within the confines of your training. Exceeding your training could lead to further injury to the injured, injury to yourself, others, legal action, and great monetary costs. We are to deliver First Aid if needed. If you have been trained to higher levels, it is important that pre-approval be obtained before going past Basic First Aid.

There can be many dangers around a crash site, fuel, oxygen cylinders, and potential falling objects. Look all around. Look up, look down, and look all around. Keep reassessing the situation. Warn others. Maintain the integrity of the scene.

**Stabilize:**

If it is required, stabilize the area to prevent further injury to the victim or injury to the rescuer. Only move items at the crash site to save lives or keep the rescuers safe during a rescuer. Do not move injured persons unless it is necessary to save a life, give First Aid treatment, or to get the injured and rescuer out of "Harms Way." Pay attention to Standard First Aid Procedures.

**The three C's:**

Check

Call

Care.

The "Primary Survey", Life threatening conditions. Practice C-Spine precautions as needed.

The "Secondary Survey." It is beyond the scope of this On-Line Training Course to teach the necessary first aid procedures. It is recommended that you take a Standard First Aid Course or an Advanced First Aid Course from a knowledgeable current instructor.

Proper packaging of the injured should also be addressed in your training.

This completes the beginning phase of your Ground Team Training. A "License to Learn".